



BIOMASS



SOLAR



WIND

Contact Focus on EnergySM to learn about renewable energy options for your home, business or organization. Full program details, applications for awards and eligibility requirements are available from the Renewable Energy Information Center. Call 800.762.7077 or visit focusonenergy.com.



COURTESY OF HRH SOLAR ENERGY SERVICES

The 10kW solar electric system installed on the roof of the Cooper School in Milwaukee is easily visible from the street. Solar energy has been incorporated into Cooper School's curriculum, and students help record and analyze school energy use and solar electricity production data.

Schools make an excellent showcase for the benefits of renewable energy. A school renewable energy system provides students with an on-site learning experience while contributing to the energy needs of the school. Students learn about real-world energy issues, including the need to reduce our use of fossil fuels, and the school reduces its energy costs. The community as a whole gains an awareness of the value of renewable energy.

While a renewable energy system will provide some of the school's energy requirements, it may provide a greater impact as an educational resource. Renewable energy systems installed for educational reasons need not be large, but they should be visible and accessible. Monitoring systems allow students to track energy and climate data.

Developing a renewable energy project for a school is a long-term process that requires leadership and commitment. The most successful school projects have been those where teachers and administrators have worked together with the community to raise the necessary funding and to integrate the renewable energy system fully into the school curriculum.

EFFICIENCY FIRST

Before investing in any renewable energy system, it is important to make the school building as efficient as possible. Reducing energy use by implementing energy efficiency strategies has the most economical impact on energy bills. By reducing energy use, a school may also be able to incorporate a renewable energy system that satisfies more of its energy requirements.

New and existing buildings can be made more energy efficient in three primary areas. These are:

- lighting systems and controls
- mechanical systems (heating, cooling, ventilating, and water heating equipment), including operation and maintenance
- building envelope (walls, floor, and roof)

Frequently, replacing major equipment has a short payback because it generates significant energy savings. A walk-through energy identification audit can identify cost effective energy efficiency measures in an existing school building.

When building a new school, the facility can be designed to perform efficiently with minimal increase in

COURTESY OF WISCONSIN



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(top) The James Madison Memorial High School in Madison, Wisconsin worked with the MGE Foundation to install this 2.4 kW solar electric system over the south entrance of the building.

(middle) The Barron Area School District has used a wood-fired boiler system to heat its schools since 1980, saving 30 percent in heating costs. New boiler controls, installed in 2005, have boosted savings further.

(above) These ground source heat pumps were recently installed on the roof of the middle school in Fort Atkinson, Wisconsin. The school's solar water heating panels are visible in the background.

building cost. The building can also be designed to include renewable energy systems, either from the outset or to be added later. For further information call 800.762.7077.

SOLAR ENERGY SYSTEMS

Schools that explore using renewable energy most frequently turn to the sun. The two most popular options for schools are solar electric panels (or photovoltaics) and solar hot water systems. Passive solar design can also work well for schools but it is most economical when integrated into the design of a new building rather than added to an existing building. Whatever solar option is chosen, the school building or site needs to receive enough sunshine so that the system functions efficiently and economically. A panel array should face south to take advantage of the greatest amount of sunlight. It should be located where shade from trees and other buildings will not block the sun, especially during the peak hours of 10 a.m. to 2 p.m. A solar site assessment (available at a discount from Focus on Energy) will help determine the best location and is an excellent investment for a school considering a solar energy system.

Solar Electricity

Solar electric systems are very popular among Wisconsin schools. Introducing solar electricity to students provides a practical way to learn about the physics of energy and electricity, as well as the impacts of energy use on the environment. An installation of panels is most effective as a demonstration if it is easily visible. Panels can be installed as an awning over a window or doorway, located along the edge of a building roof, or mounted on a pole, called a solar flag, that is located at ground level away from the building. A small solar electric system is usually connected to the utility grid, but could remain off-grid, storing power in a battery bank. Life expectancy of a typical system is 40 years to 50 years. Little maintenance is needed on stationary systems.

Solar Hot Water

Solar hot water systems can be the most economical solar energy option to install. They can be used for space heating but they typically heat water for use in sinks, showers and kitchens, or for swimming pools. Solar pool heating systems designed for seasonal outdoor pools are quite cost effective because they don't require freeze protection. Hot water efficiency measures such as water-saving showerheads and additional pipe insulation are recommended to stretch the value of a solar hot water system. Even though Wisconsin has a cold climate, a typically sized system can provide up to 50 percent of a facility's hot water needs annually.

WIND POWER

A wind turbine is a very appealing renewable energy project for students, but turbines are most appropriately sited in open, rural areas rather than in cities or towns. Turbines work best where the wind source is steady and strong. Nearby trees, buildings, and other tall structures reduce wind speed and can cause air turbulence which reduces turbine efficiency dramatically. This is one reason that wind energy experts do not recommend installing wind turbines on tops of buildings or existing structures.

For any wind turbine project, a wind site assessment is essential for determining the quality of the wind resource. For schools located in



The MGE Foundation worked with Madison's East High School to install the 2.4 kW solar electric system shown in the foreground. Behind it on the left is a solar water heating system. A third solar technology, passive solar skylights, can be seen on the right.

an appropriate rural location that are considering installing a turbine, a wind site assessment is required if they wish to apply for a Focus on Energy financial incentive.

GROUND SOURCE (GEOTHERMAL) HEAT PUMPS

Ground source (or geothermal) heat pump systems can both increase comfort and decrease operating costs for Wisconsin schools. By circulating fluid through underground piping, these systems use the relatively constant temperature of the earth to both heat and cool buildings. Many schools prefer this technology because the environment in individual classrooms and activity areas can be controlled separately, and air duct systems are greatly simplified. However, this technology is most economical where buildings use both heating and air conditioning throughout the year. Also, it is less expensive to install when designed into new school buildings rather than added later. Schools in both Fond du Lac and Evansville are using geothermal heat pump heating and cooling systems.

BIOMASS FUEL

Many different types of organic material can be converted into fuel—wood chips or wood pellets, corn, or pellets made of crop waste or grasses. The fuel can be burned to produce hot water, or used for space heating. A number of schools in Wisconsin have taken advantage of nearby wood or other biomass resources and reduced their heating bills by installing a biomass-fired hot water boiler. Fuels for Schools, a Focus on Energy program, encourages school districts to explore this possibility for their buildings. Additional information can be found by downloading the **Heating with Biomass: A Feasibility Study of Wisconsin Schools Heated with Wood** at focusonenergy.com/biomassforschools.

FIRST STEPS TOWARD A RENEWABLE ENERGY SYSTEM

The first step toward installing a renewable energy system in a school is to organize an Energy Team from the school district that will support and move the idea forward. The team could include the school energy manager, the facilities manager, the district administrator or superintendent, the principal, a teacher representative, a student

INFORMATION SOURCES FOR KIDS AND THEIR TEACHERS



Utility Renewable Energy Web sites

Contact your local utility to learn what renewable energy information they offer for kids and their teachers.

Kids Saving Energy

U.S. Department of Energy, Energy Efficiency and Renewable Energy
eere.energy.gov/kids

This site focuses on saving energy, the important first step. It features a number of energy games for kids and includes a section with lesson plans and activities for parents and teachers.

Energy Kids Page

U.S. Department of Energy, Energy Information Administration
eia.doe.gov/kids

A web page that provides basic information about a wide range of energy subjects and resources, and includes a teacher's guide.

Climate Change Kids Site

U.S. Environmental Protection Agency
epa.gov/climatechange/kids/cc.html

A page on the U.S. EPA Web site that is directed toward kids, this is a source of information about climate change causes and solutions.

INFORMATION SOURCES FOR TEACHERS

Utility Renewable Energy Programs

Contact your local utility to learn what renewable energy programs and incentives they offer to schools.

Clean Energy 101

Union of Concerned Scientists

ucsusa.org/clean_energy/clean_energy_101

The Union of Concerned Scientists has devoted a section of their Web site to basic information about clean energy sources. This page has links to a number of articles including “How Wind Energy Works,” “7 Ways to Switch America to Renewable Energy,” and “Environmental Impacts of Renewable Energy.”

Midwest Renewable Energy Association the-mrea.org

Located in Custer, Wisconsin, the MREA is famous for its Energy Fair and its solar tour of homes and businesses in the fall. Its Web site provides useful resources including information about extensive renewable energy courses and other activities.

A Consumer's Guide to Energy Efficiency and Renewable Energy U.S. Department of Energy, Energy Efficiency and Renewable Energy apps1.eere.energy.gov/consumer

This Web site presents a cross section of information for people interested in clean energy options for their homes or businesses. It outlines applications of renewable energy resources, and provides links to information about incentives and energy efficiency products.

The American Solar Energy Society www.ases.org

A national nonprofit organization, founded in 1954, dedicated to increasing the use of solar energy, energy efficiency and other sustainable technologies. Its Web site includes information about national events, government action and the potential for green jobs.

American Wind Energy Association www.awea.org

This is the national organization for the wind industry and this Web site is a good resource for information about current events, careers in the wind industry, and reports on the future of wind energy.

representative, a representative from the PTA, a school business official, a school board member, a local utility representative (such as a district account manager), and an energy advisor from the Focus on Energy Program. As part of its initial investigation for a solar or wind energy system, the team can arrange for a renewable energy site assessment by calling the Focus on Energy Info Center at 800.762.7077 or visiting focusonenergy.com/siteassessments.

INCENTIVES

Focus on Energy works with eligible Wisconsin residents and businesses to install cost effective energy efficiency and renewable energy projects. Some utilities will match the Focus on Energy renewable energy incentives. For information on energy efficiency and renewable energy incentives call, 800.762.7077 or visit focusonenergy.com/incentives.

CURRICULUM SUPPORT

The Wisconsin K–12 Energy Education Program (KEEP) provides education resources about energy efficiency and renewable energy to Wisconsin's public and private K–12 schools. KEEP offers professional development and networking opportunities for teachers, fun student involvement projects, educational energy resources, and more. School districts offering KEEP courses may encourage others to support renewable energy projects. Contact KEEP to learn more about renewable energy courses and projects. Call 715.346.4770 or visit uwsp.edu/keep, for more information.

LEARN MORE

Fuels for Schools

To learn more, download **Heating with Biomass: A Feasibility Study of Wisconsin Schools Heated with Wood** from the Focus on Energy Web site. focusonenergy.com/biomassforschools

Focus on Energy Schools & Government Program

Focus on Energy works to advance the installation of cost-effective energy improvements in public schools, private schools, colleges, universities and state/local government facilities. Focus on Energy offers these organizations services to identify, select, and implement energy improvement projects. Call 800.762.7077 for more information. focusonenergy.com/Business/Schools-and-Government

Focus on Energy Case Studies

Visit the Focus on Energy Web site for case studies about the Barron Area School District wood-burning boiler (in the Biomass section) and the Fond du Lac High School geothermal heating and cooling system (in the Geothermal section).

focusonenergy.com/re literature

